

New methods of In-Situ Metrology and Process Control for EBF3 Additive Manufacturing, Phase II

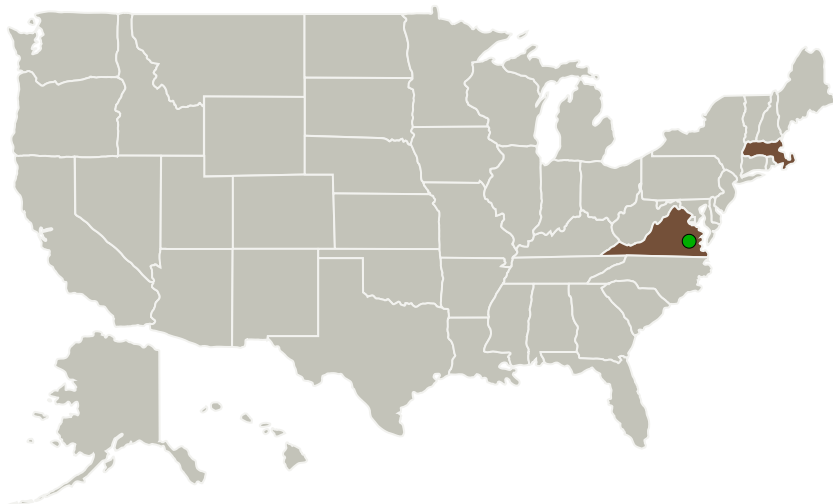
Completed Technology Project (2015 - 2019)



Project Introduction

The proposed innovation is a methodology for advanced process control and deposition analysis built around using signals generated by beam-component interactions in the Electron Beam Free Form Fabrication (EBF3) system. Based upon our successful Phase I results, these signals have the potential to be used for many forms of both metrology and process control. While many material properties might be studied by using this interaction, our initial focus is an investigation into beam and sensor characteristics for geometric analysis of the deposition. Signals derived from the electron beam-component interaction could offer spatially resolved dimensional information about the deposited material, as it is being deposited. This is important, as the ability to monitor a parameter during deposition creates the possibility of controlling that parameter during the deposition process. As a further refinement, the ability to collect and store a spatially resolved pass-by-pass map of the deposition path geometry may have value in on-the-fly adjustments to subsequent build passes. Such mapping would allow working with the layer-by-layer nature of the deposition process to fine tune the deposition geometry. Such spatially resolved, layer-by-layer deposition mapping could also be stored, giving a three dimensional mapping of the as-built deposition path geometry. This could prove valuable for component quality assurance.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Completed Technology Project (2015 - 2019)



Organizations Performing Work	Role	Type	Location
COSM Advanced Manufacturing Systems, LLC	Lead Organization	Industry	Ipswich, Massachusetts
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Massachusetts	Virginia
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Project Transitions

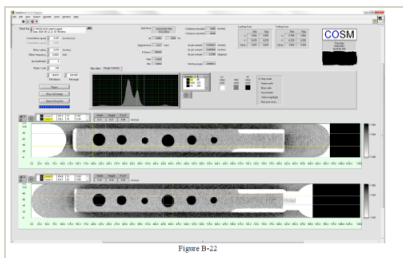
▶ **May 2015:** Project Start

✓ **March 2019:** Closed out

Closeout Documentation:

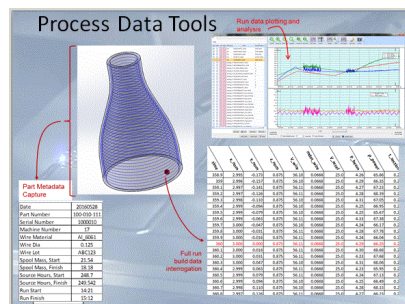
- Final Summary Chart(<https://techport.nasa.gov/file/138354>)

Images



Briefing Chart

New methods of In-Situ Metrology and Process Control for EBF3 Additive Manufacturing Briefing Chart
(<https://techport.nasa.gov/image/135658>)



Final Summary Chart Image

New methods of In-Situ Metrology and Process Control for EBF3 Additive Manufacturing, Phase II Project Image
(<https://techport.nasa.gov/image/134225>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

COSM Advanced Manufacturing Systems, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

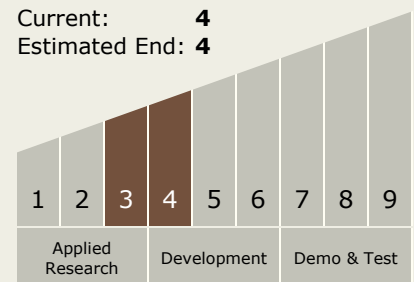
Robert Milgate

Technology Maturity (TRL)

Start: **3**

Current: **4**

Estimated End: **4**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System